DOCUMENT RESUME

ED 184 308 **FL 010 945**

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TITLE Computer-Based Hindi Pedagogy.
PUB DATE 79
NOTE 13p.; Paper presented at the annual meeting of the Linguistic Society of America (53rd., Boston, MA. December 28-30, 1978).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS College Second Language Programs; Computational Linguistics; *Computer Assisted Instruction; Computer Managed Instruction; Computer Oriented Programs; Computers; Higher Education; *Hindi; *Individualized Instruction; *Programed Instruction; Programing Languages; *Second Language Instruction; Second Language Learning; *Teaching Methods

ABSTRACT

This paper brings out the structure and salient features of the Computer-Based Hindi Teaching (CBHT) course, which is being developed at the University of Illinois. The following topics are treated specifically: (1) areas of the Hindi Language course that can be efficiently and economically taught with computer-based pedagogy; (2) a demonstration of how the CBHT Course supplements non-computer-based Hindi teaching; and (3) claims about the development of testing procedures that are more satisfactory and efficient than procedures realized in non-computer-based teaching. In addition, the paper has implications for computer-assisted instruction. The course has been developed on the PLATO IV computer. PLATO IV, (Programmed Logic for Automated Teaching), is an economically feasible, large-scale, computer-controlled teaching system. It is being used to teach courses in medicine, science, and a number of foreign languages. (Author/AMH)

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Computer-Based Hindi Pedagogy

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1979

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0. INTRODUCTION

One of the central aims of educationists is to provide highly individualized instruction on a universal basis. In order to achieve such aims, they looked towards technology. Computer-Assisted Instruction (henceforth, CAI) has made these aims realizable and the emergence of PLATO IV is a major break-through in this area. PLATO has not only caused the spectrum of CAI to undergo radical changes by registering significant advances in the area but also has allayed the skepticism about its future which has been voiced in some quarters. This paper is in part a progress report of the project on the Computer-Based Hindi Pedagogy at the University of Illinois. However, before I present such a report, it is crucial to give a brief description of the nature and scope of computer-based instructional facilities developed at Urbana-Champaign.

1.0 PLATO IV: A COMPUTER CONTROLLED TEACHING SYSTEM

PLATO IV, an abbreviation for Programmed Logic for Automated Teaching Operation, is an economically feasible, large scale, computer controlled teaching system. It represents the more advanced stage of PLATO III and is currently in operation at the University of Illinois. As a note of clarification, it will not be inadequate to point out that PLATO IV is not just another laboratory curiosity. It is actually being employed to teach courses in twenty fields, ranging from astronomy to the medical sciences. Foreign language teaching on PLATO includes western languages (such as English as a second language, French, German, Italian, Latin, Russian, Spanish) as well non-western languages (such as Chinese, Hindi, Hebrew, Japanese, Arabic, Swahili).

1.1 PLATO IV CONFIGURATION

The Plato system[1] consists of a central computer and several hundred terminals. Each student communicates with the computer through a terminal. The terminal, with inherent memory, has a plasma display panel with an attached keyboard on the outside. The display panel is an $8\frac{1}{2}$ inch square glass panel containing a 512 x 512 matrix display. Any individual dot can be selectively lighted. The keyboard looks like that of an electric typewriter with the addition of some functional keys such as NEXT, BACK, HELP, DATA, etc., the pressing of which allows the student to branch to a designated section of a lesson. The student watches the display on the panel and communicates with the computer mainly through the use of the keyboard. In addition, there are four types of ancillary equipment available: an audio device permitting random access to messages recorded on a disk, a touch panel attachment enabling the student to respond by touching the display screen instead of typing, a slide selector allowing a microfiche to be rear projected and superimposed on the panel, and an external input capability of interfacing with other machines. Terminals are connected

by telephone wires to a SDC CYBER 73 computer with two central processors.

The programming language called TUTOR, has been designed by the PLATO system personnel. The TUTOR language can be quickly learned by people who have no expert knowledge of computers (see Sherwood: 1974).

The PLATO software system has the ability to interact with students. It can ask questions and correct their errors. It can tell them what word contained the error and what type of error (spelling or otherwise) was made. The computer responds within a fraction of a second and can force students to review areas of difficulty. In addition, it can record and remember their responses. Also, it has the ability to generate questions and to examine responses to the generated questions.

2.0 COMPUTER-BASED HINDI TEACHING

The Computer-Based Hindi Teaching (henceforth, CBHT) is currently being developed at the University of Illinois. The development of the project can be divided into experimental, developmental and final stages. The experimental work[2] was initiated by the author of this paper under the supervision of Professor Y. Kachru in 1974. The project entered into its second stage, i.e., the developmental stage, as the result of the joint effort of Mr. Cecil Nelson and myself. Currently, it is being subjected to rigorous editing, supplementation and testing procedures before its final stage is achieved. During the developmental stage, technical development was carried out by Dr. R. Hart. In this paper, I will report the work done on the project during the first two stages and will set aside the matters dealing with the final stage for future discussion.

3.0 GENERAL GOALS SET FOR CBHT

The main goals set for the current project have been the following: (a) to isolate potential areas of Hindi and Sanskrit language courses that could efficiently be taught with computer-based pedagogy so as to supplement the regular, non-computer-based teaching; (b) to provide individualized instruction, especially at the early (e.g., script-learning stages), so as to make classroom instruction more efficient, and economical by eliminating problems arising out of a non-synchronic pace of learning; (c) to supplement non-computer-based Hindi teaching with additional lessons on the various aspects of the language, e.g., grammar, cultural background, vocabulary, etc,; and, finally, (d) to provide for instant review of basic material for the use of advanced students.

4.0 GENERAL DESIGN AND ORGANIZATION

The general organization of our CHBT course on the student screen is as follows. When a student signs for the lessons, the computer asks his name and greets him in Hindi. After that the student is presented with an index page on the screen. The index page contains a table of contents and the list of lessons. The student can thereon choose a lesson to study by

typing an appropriate number corresponding to the lesson of his choice. Each individual lesson also has a table of contents listing sections of the lesson. The concept of sequencing, which involves seclection, grading, presentation and testing, has gone into the planning of our Hindi lessons on PLATO.

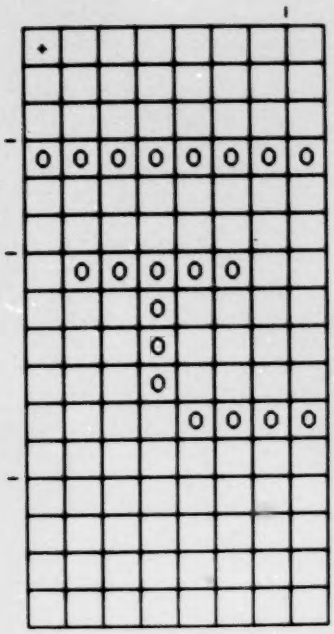
All the lessons programmed so far are followed by exercises. An attempt has been made to make some exercises generative in nature. In other words, some exercises randomly select questions out of a set of given questions and present them to the student so that whenever he signs his name, he comes across a new quiz. Built into these exercises is an option for a student to review his material in case he is not prepared for a quiz.

All the characters of the Devanāgarī script were designed individually on a 16 by 16 grid on PLATO as shown in the Figure One. We implemented an on-line PLATO program to store the designed characters in a computer file for use. The creation of the script has made it possible to type languages such as Hindi, Marathi and Nepali on the PLATO screen. A special set of the important and frequent conjunct Devanāgarī graphemes has also been created to facilitate the writing of the Sans_krit language on PLATO (see Appendix I for the PLATO Hindi keyboard). On the student screen, our lesson on Devanāgarī script introduces graphemes in small sets, teaches them to type the graphemes and master the order of strokes. The creation of the Devanāgarī script marked the end of the experimental stage of the Hindi course on PLATO and it serves as a foundation of CBHT.

5.0 CREATION OF THE DEVANĀGARĪ SCRIPT

In developing a computer-based Hindi teaching system, our first and foremost task was to create the Devanāgarī script on PLATO. First of all, the very high number of the Devanāgarī characters and the complexity of its strokes posed a serious challenge for programming. The strict limitations of charset space called for many crucial decisions in the course of programming often forcing us to decide between traditional pedagogical practice and alternative methods that would accommodate the characters within the limited space of the PLATO keyboard. In addition, the non-linear nature of the Devanāgarī script presented several technical problems. Therefore, our main problems were primarily three; one, to program each character in an adequate manner; two, to overcome the inadequacies of graphemic representation of the Devanāgarī script resulting from algorithmic properties of the machine; and, three, to achieve efficiency and to improve performance in writing the Devanāgarī script on PLATO in terms of speed and graphic precision. Perhaps it should be added that given the traditional sequencing of syllabic and non-syllabic characters, it would have been practically impossible to program the Devanāgarī script on PLATO. However, all the three problems are solved and a new system was deviced as the result of the careful structural analysis of the Devanāgarī graphemes and the successful exploitation of options available at each point on PLATO. And, with the system developed, the desired goals of programming the Devanāgarī script on PLATO have been achieved, without, at the same time, sacrificing traditional practice. (For details see Bhatia, 1977).

Character Design



\+ move point mode
o store point mode
\- remove point mode
i inspect character
B blank character
F full character

This ₸ is your character

c 3

BACK to format when you are done

SHIFT-BACK to format and go to main page

SHIFT-HELP to exit without formatting

Press DATA to restore original character
LAB for octal design

Figure 1

6.0 TEACHING OF THE HINDI LANGUAGE

During the developmental stage, several other lessons dealing with Hindi Phonetics, Grammar, Conversations, and Vocabulary were added to the course. The list and contents of these lessons can be obtained from the language learning laboratory of the University of Illinois. Therefore, I will not detail them here. Instead, I will offer briefly some remarks on the design of these lessons which will explain to some extent the strategies which have gone into the teaching of the various aspects (Phonetics, Grammar, etc.) of the language on one hand and will reveal some interesting properties of our CBHT course on the other.

Most of the lessons dealing with vocabulary, conversations, and phonetics are interphased with an audio unit. The audio unit uses magnetic recording on a flexible-plastic disk of 15 inches in diameter. One half second is the average time required for the disk to begin playing after receiving a command. Most of our lessons are recorded on this disk and students can listen to any lexical item, sentence or isolated sound used in the lessons. For example, the lesson on Hindi phonetics incorporates individual sound segments such as retroflex or voiced aspirated sounds. In going through this lesson, students can not only listen to the pronunciation but are also required to successfully distinguish them in quizzes (see Appendix II). They can indicate their choice by touching the item or by typing the appropriate number.

The vocabulary lesson is designed to help students with new words encountered in a lesson. This lesson contains 26 drills of about 10 items each. Each drill is offered in the student's choice of three formats: translation written Hindi to English, translation written English to Hindi, and dictation, i.e., audio Hindi to written Hindi. Full keyboard typing help is constantly available for each drill. The key-LAB replays audio message. HELP-key provides an immediate access to answers.

The grammar and exercise sections are not rigidly separated. The grammar lessons includes topics such as verb forms, tenses, negation, question and answering systems, plural formations, oblique cases, etc. Drills often follow the explanation of a grammatical point. This lesson embodies substitution, transformation, fill-in-blanks, and translation exercises. Appendix III and IV present a sample of a grammar and exercise lesson, respectively.

One of the most important and unique aspects of computer-based pedagogy on PLATO is that it allows each student to advance at his own pace and to learn at the time he chooses. It makes judgments on the student's response and corrects mistakes before he goes on to compound similar errors. A correct answer is shown to the student usually when a student fails to correct his answer twice. It can also tell a student about the nature of his error, i.e., whether the mistake is a spelling mistake or a grammatical one. Furthermore, PLATO can keep the record of a student's performance which is automatically updated each time he finishes a lesson: a class average and a warning is given if his performance is poor. Readjustment takes place after the student retakes a quiz. The enormous amount of data gathered from a student's performance record makes the

testing procedures truly objective and realizable. The data gathered on every aspect of each student's language learning process, ranging from each vocabulary item to every grammatical point, provide an opportunity to test various theories of learning and at the same time it makes it possible to measure the student's language gain and language loss in a truly exhaustive, objective and systematic manner. Also, the tests at the University of Illinois show that graphic display and animation on PLATO increase the pace of learning (see Alpert and Bitzer, 1970).

7.0 CONCLUSION

Although most of the technical and methodological problems have been solved and encouraging results have been registered, it is still in the developmental stage. Perhaps it should be added that even in its advanced stages, it will never be able to replace a human instructor; the only thing it can do is successfully exploit the complementary abilities of man and machine.

NOTES

* This paper was presented at the 53rd Annual Meeting of the Linguistic Society of America and American Association of Applied Linguistics on December 28-30, 1978 in Boston, Mass. I am thankful to Professors Braj B. Kachru and Y. Kachru for their encouragement and invaluable suggestions from time to time which made it possible to develop computer-based Hindi course.

1. For details of the PLATO system, see Sherwood (1974), Sherwood and Stifle (1975), and Smith and Sherwood (1976).

2. See Bhatia (1975) for details on the work done during the initial stage on this project.

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HINDI KEYBOARD

क	ka	k	ख	kha	K					ा	ā	A		श्र	śra	1c
ग	ga	g	घ	gha	G	ि	i	i		ी	ī	I		त्र	tra	1C
च	ća	c	छ	ćha	C	ु	u	u		ू	ū	U		ध्य	dhya	1d
ज	ja	j	झ	jha	J	े	e	w		ै	ai	W		ह्म	hma	1h
ट	ṭa	+	ठ	ṭha	+↑	ो	o	o		ौ	au	O		ज्ञ	jya	1J
ड	ḍa	-	ढ	ḍha	-↑	ृ	ri	R						क्ष	kśa	1k
ण	ṇa	N												द्ध	ddha	1H
त	ta	t	थ	tha	T	अ	a	♦a		आ	ā	♦A		त्त	tta	1L
द	da	d	ध	dha	D	इ	i	♦i		ई	ī	♦I		द्र	ṭra	1V
न	na	n				उ	u	♦u		ऊ	ū	♦U				
प	pa	p	फ	pha	P	ए	e	♦e		ऐ	ai	♦E		♦ = MICRO		
ब	ba	b	भ	bha	B	ओ	o	♦o		औ	au	♦O		1 = SUPER		
म	ma	m				ॠ	ri	♦r						↑ = SHIFT		
य	ya	y														
र	ra	r				ऋ	ru	=		ॡ	rū	)		♦ moves		
ल	la	l				ँ	ra	f		ॅ	ra	F		diacritics		
व	va	v												halfspace		
श	śa	z				:	aspir	H						left		
ष	ṣa	Z				ं	nasal	x								
स	sa	s				ॅ	nasal	M						MICRO gives		
ह	ha	h				.	arabic	X						half		
ञ	ny	÷				़	stop	q						consonant		
ङ	ng	×														

press NEXT for exercise

unit: phonetics
exercise type 2
now contrasting 1-syllable words

disc: hinditwords
item 12
25 to go

Exercise 2 type/touch the item you hear

Touch the item, or type 1 for LEFT, 2 for RIGHT

BACK → index; SHIFT-BACK → index of lessons

2.3 POSTPOSITIONS, PART I

In English, prepositions are used with nouns or pronouns (e.g., at the door, on the wall, with him). Equivalent constructions are expressed in Hindi by postpositions: they occur after the noun or pronoun with which they are associated. Compare the Hindi and English constructions:

Hindi:	English:
noun/pronoun + में	'in' + noun/pronoun
noun/pronoun + पर	'on' + noun/pronoun

Some examples of postpositions in sentences:

किताब में क्या है? 'What is in the book?'

घर में कौन है ? 'Who is in the house?'

मेज़ पर क्या है ? 'What is on the table?'

NEXT → next section; BACK → previous section;
SHIFT-BACK → grammar index

Appendix IV

unit 1 item 32
exercise c 31 to go

Answer the question about this picture:

क्या वह लड़की है?

»

जी हाँ, वह लड़की है।

SHIFT:	aspirate consonants;					long vowels						
MICRO:	half-consonants;					initial vowel forms						
SUPER:	compound consonants											
◆ :	position diacritic half-space left											
ट	+	ण	N	ऋ	=	◌	f	◌	q	◌	x	
ड	-	श	z	ॠ	+=	◌	F	◌	X	◌	M	
ठ	+◆	ष	Z			◌	R					
ढ	+-											

DATA → grammar; HELP → answer; SHIFT-LAB → English
BACK → index of parts; SHIFT-HELP → instructions
SHIFT-DATA → full keyboard; ANS → skip item